

REMARKS

This Amendment and Response to Final Office Action is being submitted in response to the final Office Action mailed December 8, 2006.

Claims 1, 3-12, 14-23, and 25-33 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Talluri et al. (U.S. Patent No. 6,615,383) in view of Brasher et al. (U.S. Patent No. 6,895,586).

In response this rejection, Claims 1, 12, and 23 have been amended to further clarify the subject matter which Applicants regard as the invention. These amendments are fully supported in the Specification, Drawings, and Claims of the Application and no new matter has been added. Based upon the amendments, reconsideration of the Application is respectfully requested in view of the following remarks.

Rejection of Claims 1, 3-12, 14-13, and 25-33 Under 35 U.S.C. 103(a) –
Talluri et al. and Brasher et al:

Claims 1, 3-12, 14-23, and 25-33 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Talluri et al. (U.S. Patent No. 6,615,383) in view of Brasher et al. (U.S. Patent No. 6,895,586).

Examiner notes that Applicants' remarks in Response to Non-Final Office Action, dated October 3, 2006, with respect to independent Claims 1, 12, and 23 are moot in view of the new grounds of rejection—Talluri et al. (U.S. Patent No. 6,615,383).

Specifically, Examiner states that "Talluri clearly defines and explicitly teaches *determining whether said message sequence indicator is one of the sequence indicators in a set of missing sequence indicators* (see col. 20, lines 31-36: 'If there is at least one

pending message whose sequence number is not found in the received notepad copy, then remedial action is required') *maintained in a table* (see col. 13, lines 37-39: 'a sequence number 'notepad' 356 for keeping track of sequence number of messages received from another node').

Applicants respectfully disagree. ***Before analyzing the differences between Talluri et al. and the present invention on a claim-by-claim, element-by-element basis, Applicants specifically point out that the analysis of the present invention's at-most-once reliable communications system claimed is conducted on the receiving module, not the sending module. Talluri et al., in contrast, analyze communications from the sending node's perspective.***

To further clarify this significant distinction, Claim 1 has been amended to recite:

A method, implemented by a communication coordinator on a module, for carrying out reliable communication in a communication system, comprising:

receiving a message from a sender intended for one or more applications, said message comprising a message identifier, and wherein said message identifier comprises a message sequence indicator;

determining, ***at the communication coordinator on the module that received the message***, based upon said message identifier whether said message had previously been received, wherein determining whether said message had previously been received comprises: determining whether said message sequence indicator is one of the sequence indicators in a set of missing sequence indicators maintained in a table; and in response to a determination that said message sequence indicator is not one of the sequence indicators in said set of missing sequence indicators, concluding that said message had previously been received; and

in response to a determination that said message had previously been received, foregoing delivery of said message to said one or more applications;

wherein a message exchange between a sender and a receiver is conducted ensuring that a message is delivered to a recipient at most once; and

wherein a subscriber is enabled to subscribe to multiple events using a single namespace specification and a single subscription request.

Similarly, Claim 12 has been amended to recite:

An apparatus for implementing reliable communication in a communication system, comprising:

a mechanism for receiving a message from a sender intended for one or more applications, said message comprising a message identifier, wherein said message identifier comprises a message sequence indicator;

a mechanism for determining, ***at a communication coordinator on a module that received the message***, based upon said message identifier whether said message had previously been received, and wherein said mechanism for determining whether said message had previously been received comprises: a mechanism for determining whether said message sequence indicator is one of the sequence indicators in a set of missing sequence indicators maintained in a table; and a mechanism for concluding, in response to a determination that said message sequence indicator is not one of the sequence indicators in said set of missing sequence indicators, that said message had previously been received; and

a mechanism for foregoing, in response to a determination that said message had previously been received, delivery of said message to said one or more applications;

wherein a message exchange between a sender and a receiver is conducted ensuring that a message is delivered to a recipient at most once; and

wherein a subscriber is enabled to subscribe to multiple events using a single namespace specification and a single subscription request.

Similarly, Claim 23 has been amended to recite:

A computer readable medium comprising instructions which, when executed by one or more processors, cause the one or more processors to implement reliable communication in a communication system, said computer readable medium comprising:

instructions for causing one or more processors to receive a message from a sender intended for one or more applications, said message comprising a message identifier, wherein said message identifier comprises a message sequence indicator;

instructions for causing one or more processors to determine, ***at a communication coordinator on a module that received the message***, based upon said message identifier whether said message had previously been received, and wherein the instructions for causing one or more

processors to determine whether said message had previously been received comprises: instructions for causing one or more processors to determine whether said message sequence indicator is one of the sequence indicators in a set of missing sequence indicators maintained in a table; and instructions for causing one or more processors to conclude, in response to a determination that said message sequence indicator is not one of the sequence indicators in said set of missing sequence indicators, that said message had previously been received; and

instructions for causing one or more processors to forego, in response to a determination that said message had previously been received, delivery of said message to said one or more applications;

wherein a message exchange between a sender and a receiver is conducted ensuring that a message is delivered to a recipient at most once; and

wherein a subscriber is enabled to subscribe to multiple events using a single namespace specification and a single subscription request.

These amendments are fully supported in the Specification, Drawings, and Claims of the Application and no new matter has been added.

Talluri et al. disclose a system and method for transmission between network nodes. In the Talluri et al. system:

Whenever **the first computer determines** that it has failed to receive a message acknowledgment [thus the first computer is the sender] from the second computer in a timely fashion, or it needs to reuse previously used message sequence numbers, **the first computer undertakes remedial actions to resynchronize the first and second computers**. The process begins **by prompting the second computer to flush and process all the messages in its receive FIFO, and then comparing sequence number information recorded by the second computer with the sequence numbers of the outstanding, unacknowledged messages sent by the first computer**. If the comparison indicates that any messages sent by the first computer were not received and processed by the second computer, those messages are re-transmitted. **If necessary, during resynchronization the first computer will activate a different communication interface** than the one previously used so as to establish a reliable connection to the second computer.” (Col. 7., lines 31-48, emphasis added).

The present invention, in contrast, processes extracted message packet information including the sequence number at the receiving node. This processing is completed after the send, receive, and acknowledgement have occurred between the sending module and the receiving module.

For example, a sending communication coordinator sends a message packet with a sequential identification number. Assuming successful communication, the receiving communication coordinator then sends an acknowledgement to the sending communication coordinator. ***Thereafter, the receiving communication coordinator extracts the IP address and port number of the receiving module from the message packet and subsequently uses them to obtain the current receiving sequence number from the reliable communication table.*** By reviewing the current receiving sequence number and comparing it to the sequence number of the message packet just received, the next action is determined.

Three scenarios may arise. Depending on whether the sequence number in the message packet is one number greater than the current receiving sequence number, whether the sequence number in the message packet is greater than the current receiving sequence number by more than one, or whether the sequence number in the message packet is smaller than the current receiving sequence number, a next action is determined.

When a sequence number is received by the receiving communication coordinator, and it is determined that the sequence number in the message packet is greater than the current receiving sequence number by more than one, one or more intermediate messages were not delivered properly. In such a scenario, the receiving communication coordinator performs at least three operations. First, it adds the intermediate sequence numbers to the Missing Sequence Number List column. Second, it updates the entry by storing the new sequence number into the Receiving Sequence #

column. In addition, it delivers the message to the appropriate application component using a component reference. In this manner, the entry is maintained/updated, and the message is delivered to the proper component.

Assuming that a missing sequence number is received by the receiving communication coordinator and the sequence number in the message packet is smaller than the current receiving sequence number, it means that the message packet is being delivered out of sequence. To determine what actions to take, the receiving communication coordinator checks the missing sequence number list. If the sequence number in the message packet is one of the numbers in the missing sequence number list, then it means that this message packet has not been received before. Thus, the receiving communication coordinator delivers the message to the appropriate application component using a component reference, in the same manner as that described previously. In addition, the receiving communication coordinator removes the sequence number in the message packet from the missing sequence number list. In this manner, the entry is properly maintained/updated, and the message is properly delivered.

On the other hand, if the sequence number in the message packet is not one of the numbers in the missing sequence number list, then it means that this message packet has been received before, and hence, the message has already been delivered to the proper application component. That being the case, the receiving communication coordinator discards the message packet, and foregoes delivery of the message to any of the application components. By doing so, the receiving communication coordinator prevents multiple deliveries of the same message. In this manner, the receiving communication coordinator enforces the "at most once" reliable communication guarantee.

Thus, in the present invention, the processing takes place at the receiving module communication coordinator. Talluri et al. do not teach or suggest this processing at the receiving communication module. Nor is this deficiency remedied by Brasher et al.

Claims 3-11 are dependent claims dependent from Claim 1. Claims 14-22 are dependent claims dependent from Claim 12. Claims 25-33 are dependent claims dependent from Claim 23.

Based on the same unique and novel features of the present invention as described above, namely that, as amended, Claims 1, 12, and 23 have unique and patentable novel features, precisely that they provide that a message exchange between a sender and a receiver is conducted ensuring that a message is delivered to a recipient at most once, it is respectfully asserted that these dependent claims are now in condition for allowance.

The differences between the invention of Talluri et al. and the invention of the present Application are now made explicit in amended Claims 1, 12, and 23. Additionally, the deficiencies of Talluri et al. are not remedied by Brasher et al. Therefore, Applicants submit that the rejection of Claims 1, 3-12, 14-23, and 25-33 under 35 U.S.C. 103(a) as being unpatentable over Talluri et al. in view of Brasher et al. has now been overcome and respectfully request that this rejection be withdrawn.

CONCLUSION

Applicants would like to thank Examiner for the attention and consideration accorded the present Application. Should Examiner determine that any further action is necessary to place the Application in condition for allowance, Examiner is encouraged to contact undersigned Counsel at the telephone number, facsimile number, address, or email address provided below. It is not believed that any fees for additional claims, extensions of time, or the like are required beyond those that may otherwise be indicated in the documents accompanying this paper. However, if such additional fees are required, Examiner is encouraged to notify undersigned Counsel at Examiner's earliest convenience.

Respectfully submitted,

Date: February 06, 2007



Christopher L. Bernard
Registration No.: 48,234
Bradley D. Crose
Registration No.: 56,766
Attorneys for Applicant(s)

CLEMENTS | WALKER
1901 Roxborough Road, Suite 300
Charlotte, NC 28211 USA
Telephone: 704.366.6642
Facsimile: 704.366.9744
cbernard@worldpatents.com